

This exhibit documents the assumptions and methodology underlying the electricity generation fuels price forecast. It deals with prices for natural gas, distillate (#2) and residual (#6) fuel oil.

Geographical markets

The regionalization of fuel markets follows natural gas trading points rather than markets for fuel oil. The forecast covers the following areas in the US and Canada

Midwest Fuel Regions	South Atlantic – South	IA/MO/NE	Appalachia	Texas – non ERCOT	Midcon	Canada
Illinois	Alabama	Iowa	Kentucky	East TX non ERCOT	Kansas	East Ontario
Indiana	Arkansas	Missouri	Ohio	North TX non ERCOT	Oklahoma	West Ontario
Michigan	Louisiana	Nebraska	Pennsylvania			
Minnesota	Mississippi		West Virginia			
Wisconsin	Tennessee					

Table 1. Geographical representation of fuel markets

Basis forecasts

The key underlying forecasts are projected prices for crude oil (WTI) and for natural gas (Henry Hub). All other forecasts are derived from these two basic forecasts using projected and/or historical basis differentials as explained later in this memo.

Figure 1 presents TCA proposed base case forecast of crude oil prices in comparison with historical prices, NYMEX futures prices for the light sweet crude oil (as of March-31-2003) and a long term forecast for crude oil prices from EIA's Annual Energy Outlook-2003. As one can see, our proposed forecast is a composition of futures prices in the short term (2003) and EIA's forecast in the long-run (2004-2020). Similarly, Figure 2 presents TCA proposed forecast for the spot price of natural gas at Henry Hub. The forecast is shown in comparison with average NYMEX futures prices (as of March-31, 2003) and a long-term forecast per EIA's Annual Energy Outlook-2003.¹ Our proposed forecast is a composition of futures prices in the near-term (2002-2007). The declining trend exhibited by the futures prices during 2003-2008 is then merges with the EIA forecast in 2009. From 2009 onward, we follow the EIA forecast.

¹ AEO-2003 does not forecast Henry Hub prices, instead it predicts prices at the wellhead. To come up with the Henry Hub price forecast, we use a historical multiplication factor of 1.13.



Generation Fuel Prices

Generation fuel prices are derived from basis forecasts. Figures 3-11 present comparisons of monthly generation fuel prices for the Midwestern region, South Atlantic – South, Iowa-Missouri-Nebraska, Appalachia, Midcon, Texas – non ERCOT (East and North), and East and West Ontario for the period 2002-2015. Figure 12 provides a comparison of regional natural gas prices.

Fuel oil prices - methodology

To derive fuel oil prices for electric generation, we use an in-house linear regression model linking crude oil prices with # 6 and # 2 fuel oil in the Northeastern US (New York Harbor). For petroleum prices in other regions, we use state specific basis differentials using EIA form 423 data for 1997-2000 and historical spot prices for # 2 and # 6 fuel oil at New York Harbor (see Table 2 below). We assume a modest seasonal pattern for # 2 fuel oil prices, the same in all regions. Prices for #6 fuel oil are assumed flat.

State	FO2 Basis (\$/MMbtu)	FO6 Basis (\$/MMbtu)
IL	0.62	0.53
IN	0.52	
MI	0.39	0.38
MN	0.82	
WI	0.56	
AL	-0.10	
AR	0.42	
LA	0.37	0.05
MS	0.18	-0.31
TN	0.28	
FL	0.49	0.01
IA	0.39	
MO	0.38	-0.35
NE	0.69	
OH	0.38	
PA	0.31	0.11
KY	0.85	
WV	0.77	
OK	0.21	
KS	0.54	-0.29
TX	0.37	0.81

Table 2. Basis differentials from NY Harbor to the burner-tip by state.

Natural gas prices - methodology



1. Price for power generation is a sum of two components – regional price and local delivery price;
2. Local delivery price is differentiated by state based on AGA statistics. This price is applied **to existing plants only** (see Table 3 below for details). For new gas-fired plants, the local component is set at \$0.07/MMbtu to reflect pipeline lateral charges. (This is our “best-guess” estimate).
3. Forecast regional gas prices are derived from the Henry Hub forecast using TCA in-house regression models calibrated on historical regional prices vs. prices at Henry Hub. The relevant price point by region are identified below:

No.	Region	Henry Hub Prices Regressed to:
1	Midwestern	Average of Chicago City-Gate and Mich Con City-Gate (Jan-99 through Jul-2002)
2	South Atlantic South	Henry Hub (Direct input)
3	IA/MO/NE	Average of NGPL Amarillo and NGPL Iowa-Illinois (Jan-99 through Jul-2002)
4	Appalachia	Average of Columbia App, Dominion and CNG (Jan-99 through Jul-2002)
5	Midcon	Average of major 8 Midcon pipeline points reported by Gas Daily (Jan-99 through Jul-2002)
6	Texas East (non-ERCOT)	Carthage Hub (Jan-99 through Jul-2002) for East TX price. The basis for Texas East non-ERCOT is taken at 50% of Carthage Hub vs. Henry Hub
7	Texas North (non-ERCOT)	NGPL (Permian) (Jan-99 through Jul-2002) regressed to Henry Hub and then taken at 50% plus 50% of Midcon
8	East Ontario	Niagara (Jan-99 through Jul-2002)
9	West Ontario	Dawn (Jan-99 through Jul-2002)

4. Seasonal patterns are developed in the following manner:

For Henry Hub, we use seasonal pattern revealed in futures prices. Revealed pattern for 2008 is assumed for all years from 2009 onward.

Regional seasonal patterns appear automatically by applying the regression model to the monthly Henry Hub forecast.



State	LDC Charge (\$/MMbtu)
IL	0.09
IN	0.36
MI	0.59
MN	0.12
WI	0.49
AL	0.37
AR	0.23
LA	0.09
MS	0.19
TN	0.37
FL	0.23
IA	0.31
MO	0.01
NE	0.13
OH	0.53
PA	0.11
KY	0.69
WV	0.26
OK	0.24
KS	0.31
TX	0.03

Table 3. LDC Charges applied for older gas-fired plants by state



Figure 1. Crude Oil Prices: History and Projections (2002\$/BBL)

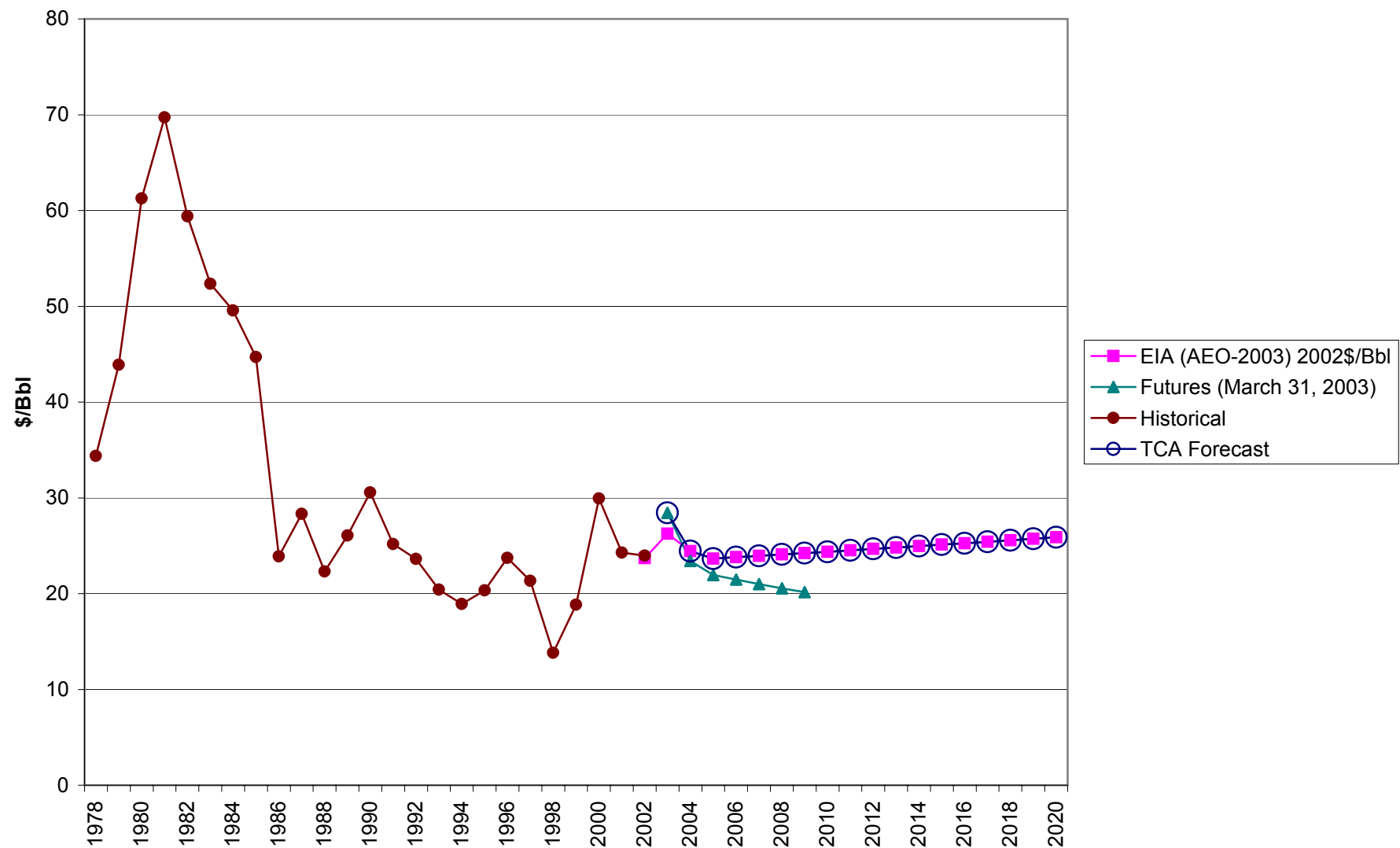


Figure 2. Natural Gas Spot Prices at Henry Hub: History and Projections (2002\$/MMbtu)

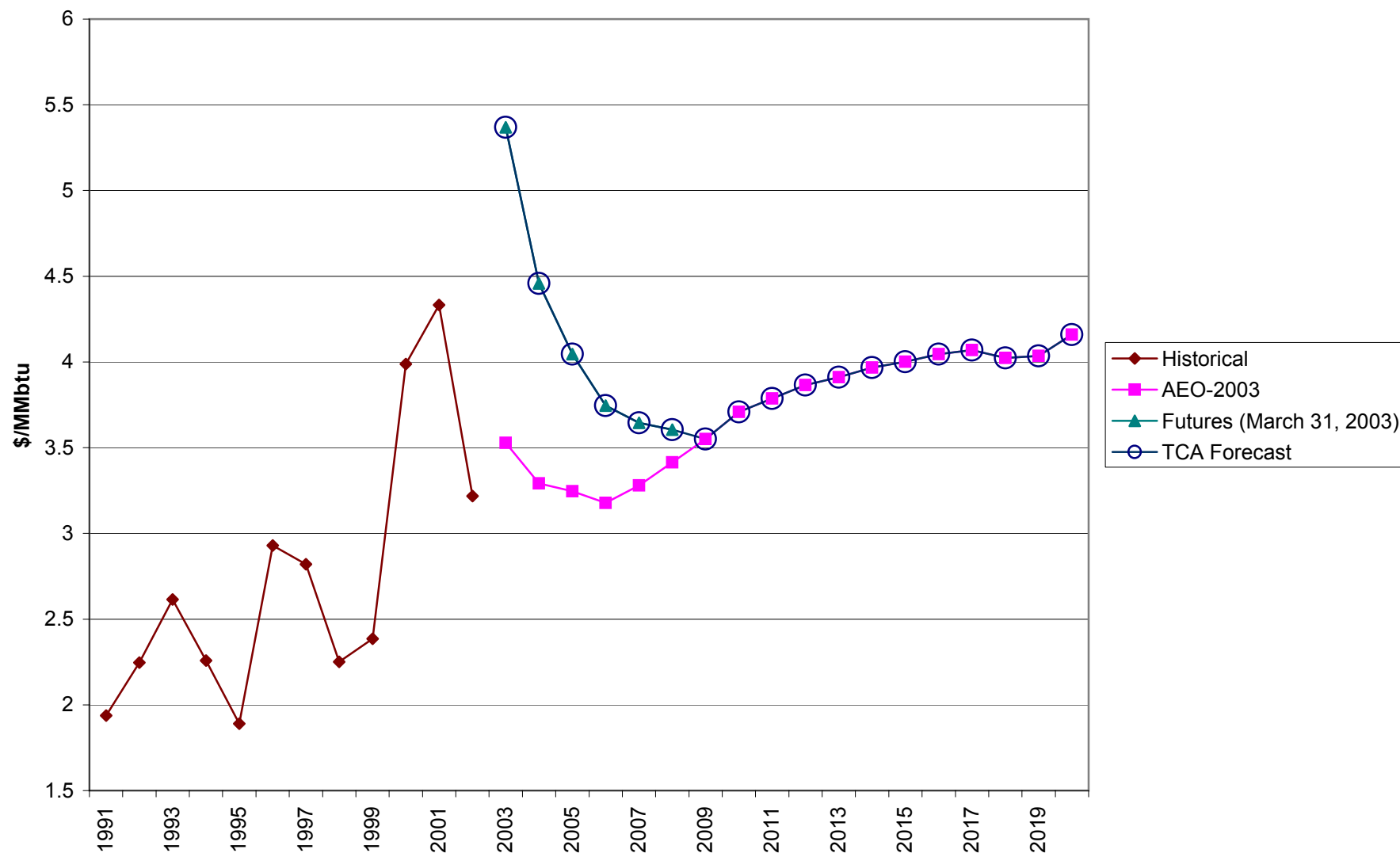


Figure 3. Fuel Price Forecast: Midwest Region (MI, IL, WI, IN, MN)

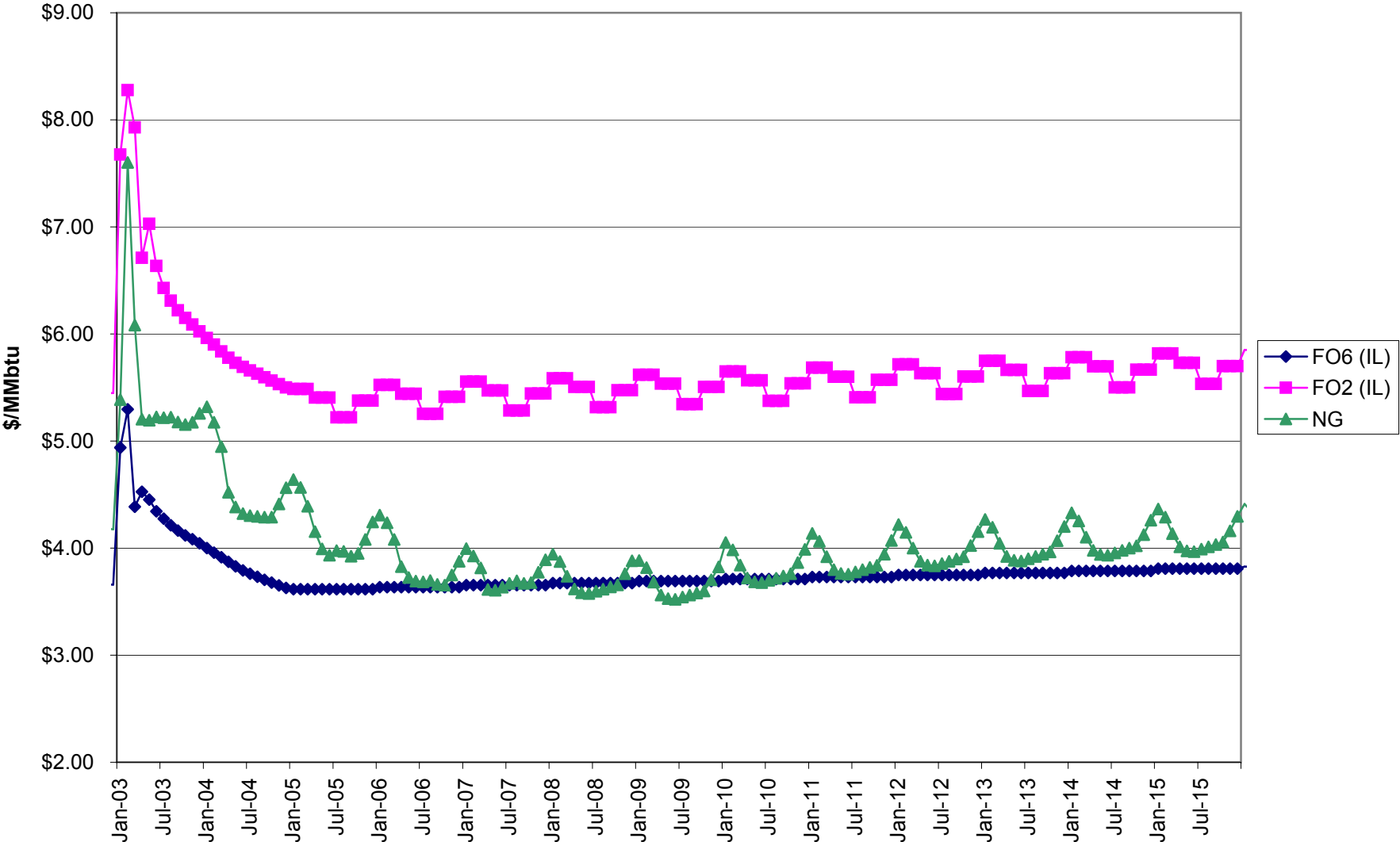


Figure 4. Fuel Price Forecast: South Atlantic - South (AL, AR, LA, MS, TN)

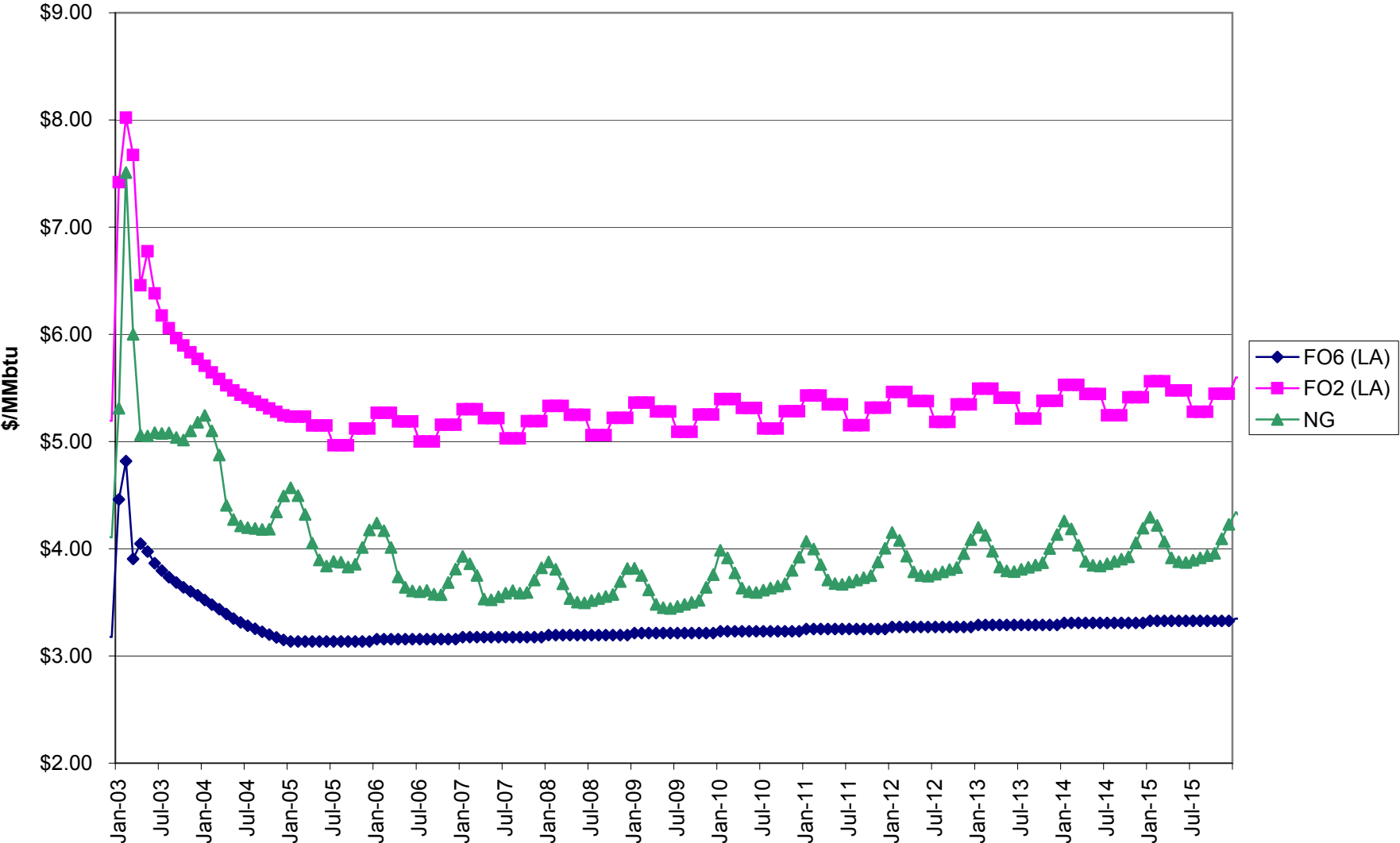


Figure 5. Fuel Price Forecast: Iowa-Missouri-Nebraska

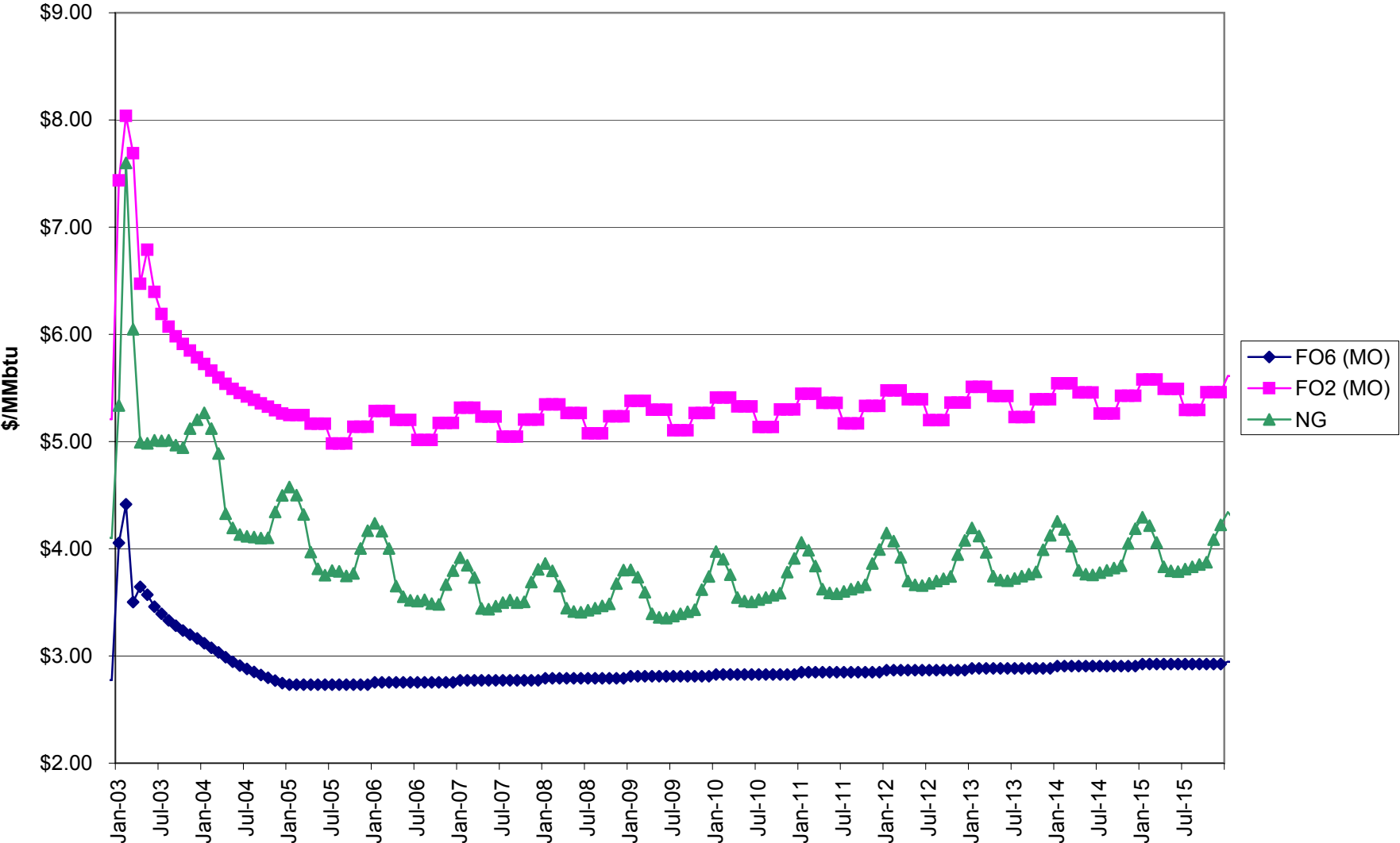


Figure 6. Fuel Price Forecast: Appalachia (W. PA, WV, OH, KY)

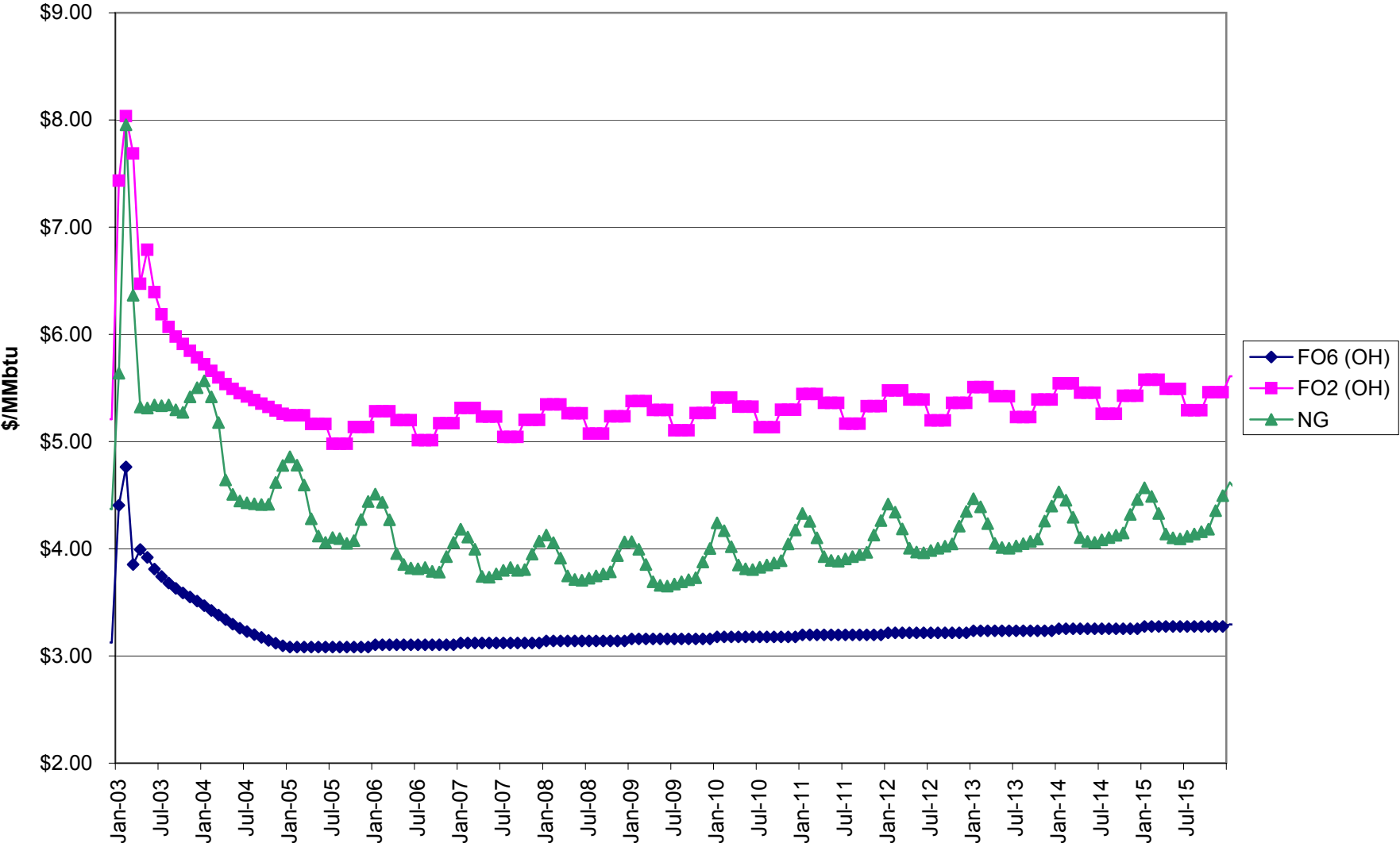


Figure 7. Fuel Price Forecast: Midcon (OK, KS)

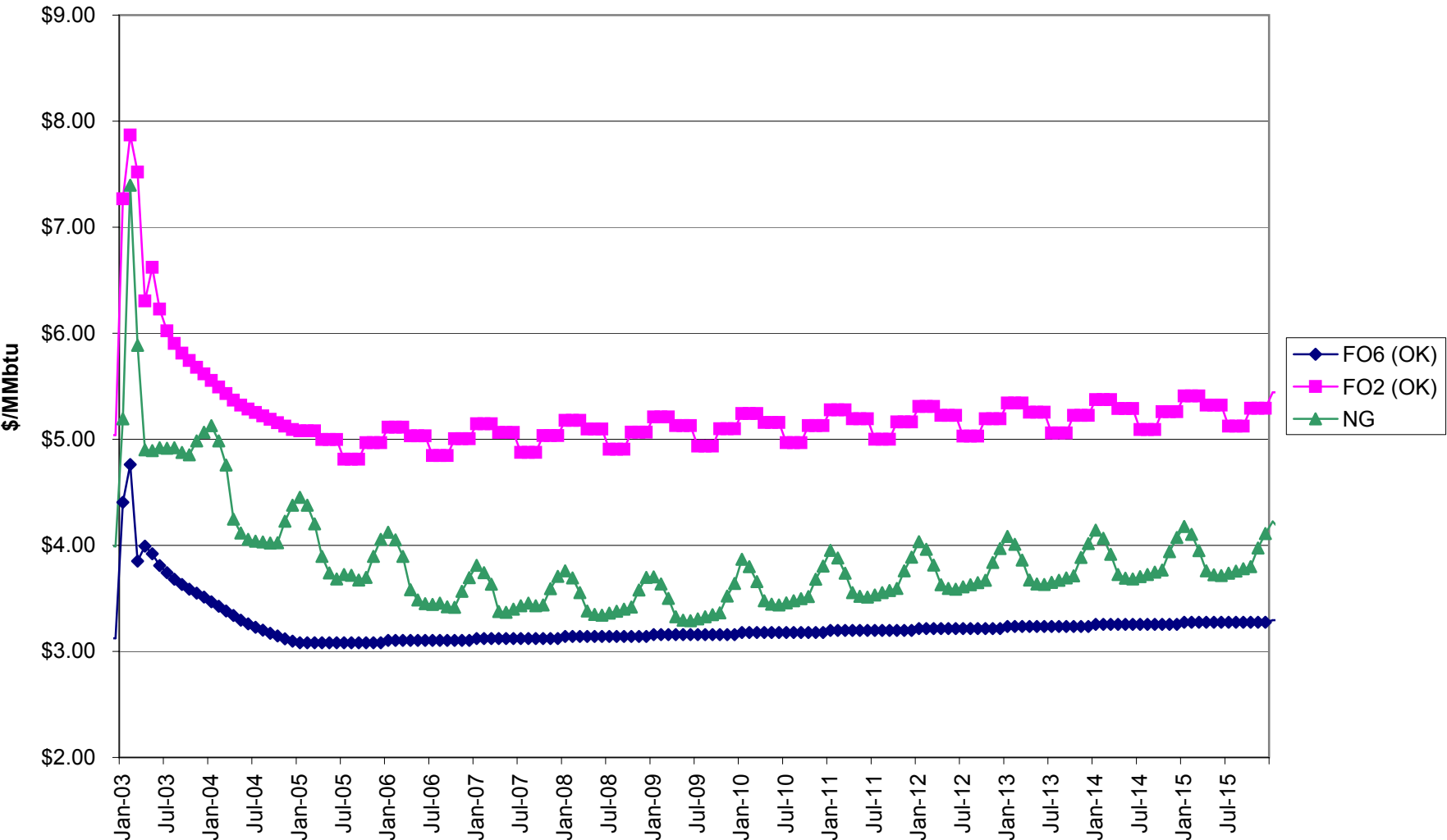


Figure 8. Fuel Price Forecast: East Ontario

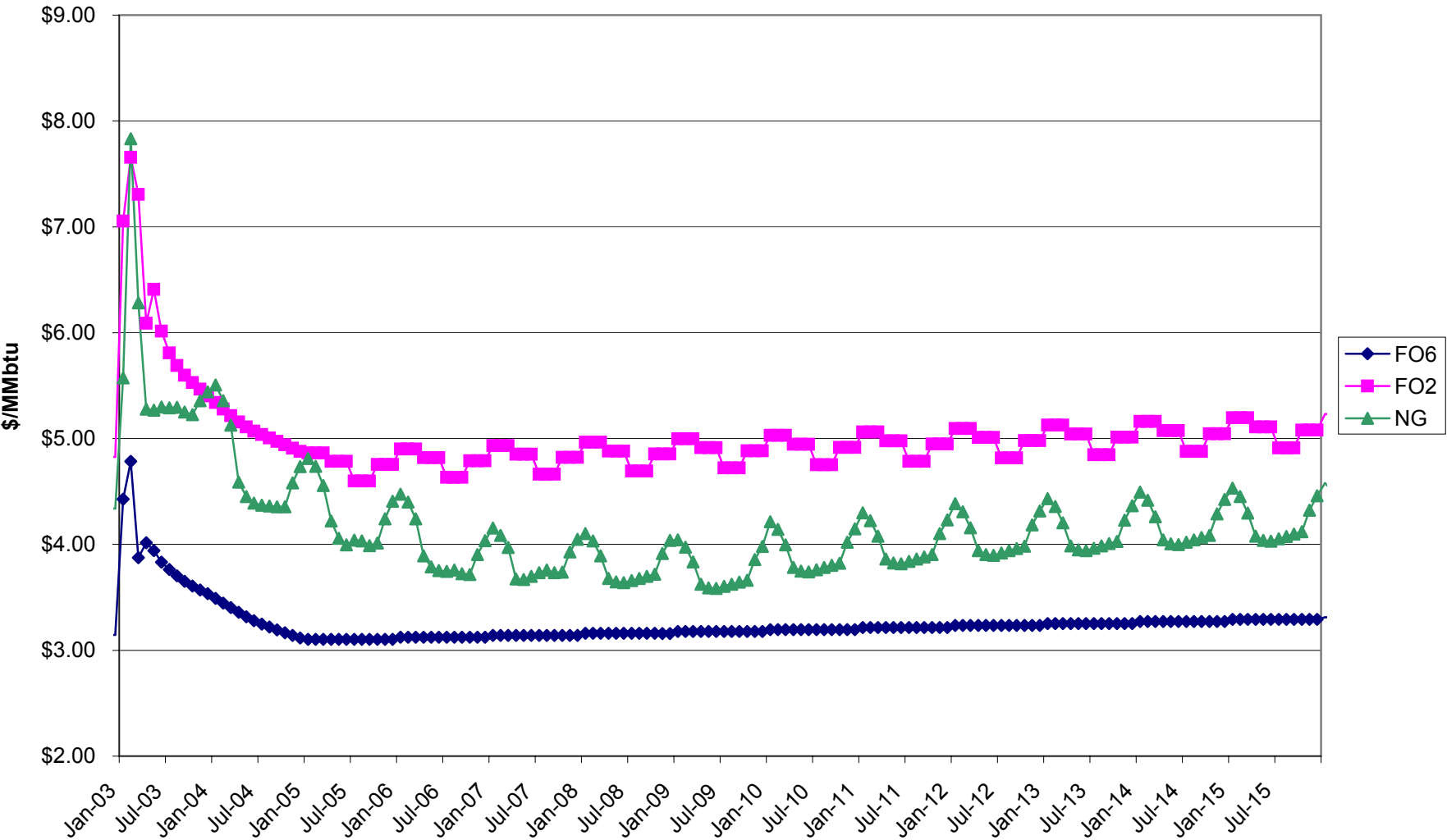


Figure 9. Fuel Price Forecast: West Ontario

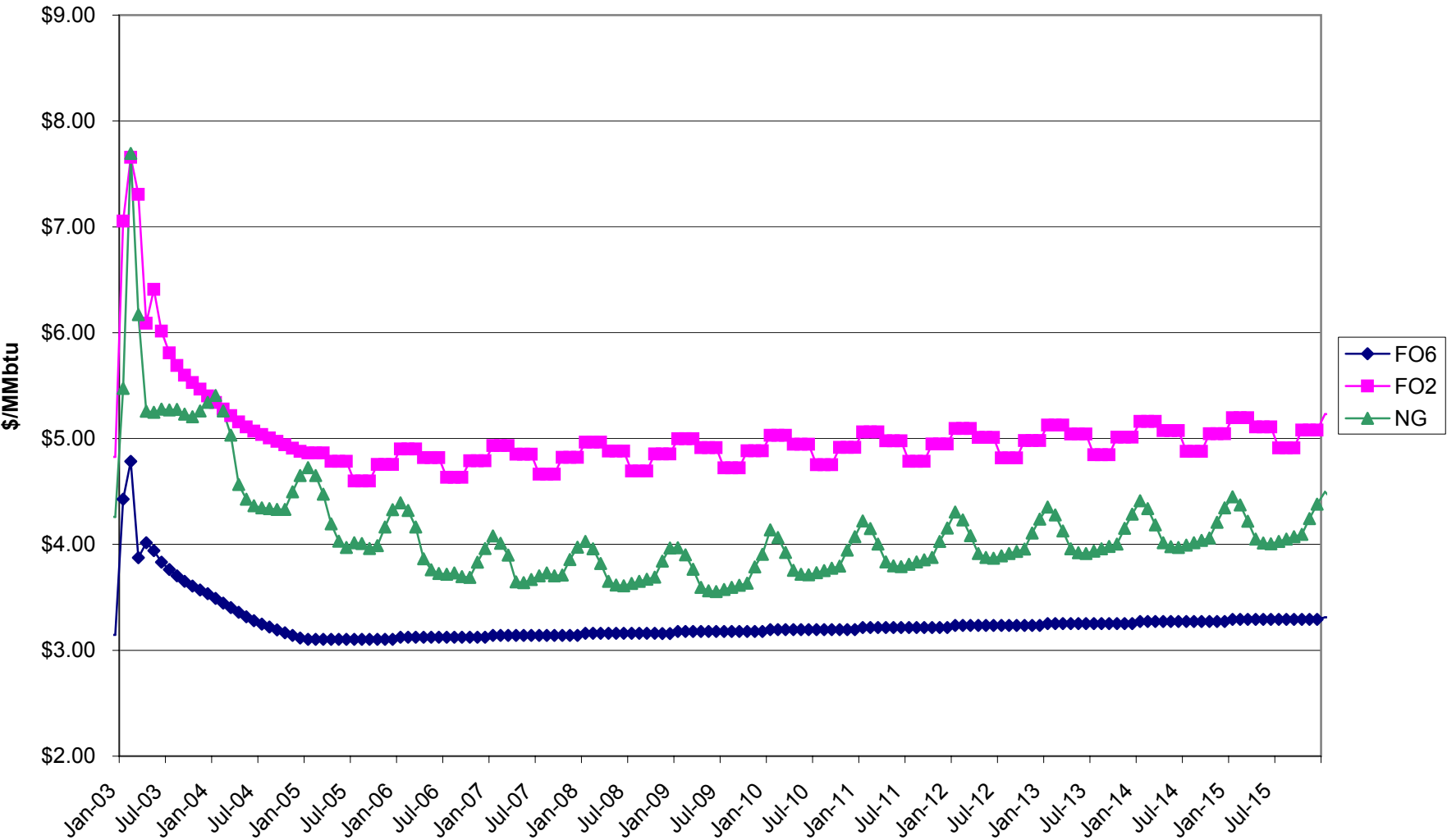


Figure 10. Fuel Price Forecast: East Texas, non-ERCOT

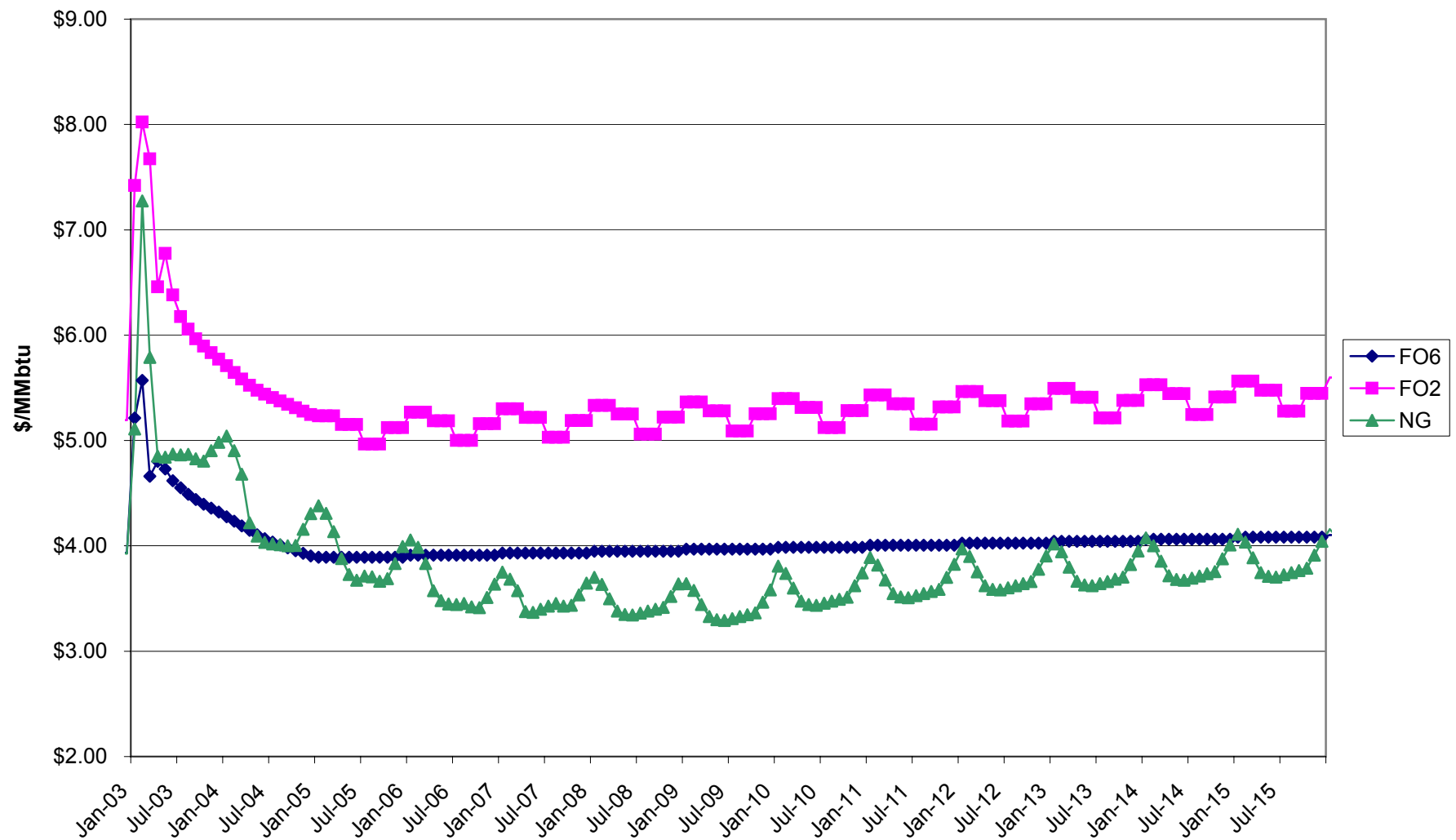


Figure 11. Fuel Price Forecast: North Texas, non-ERCOT

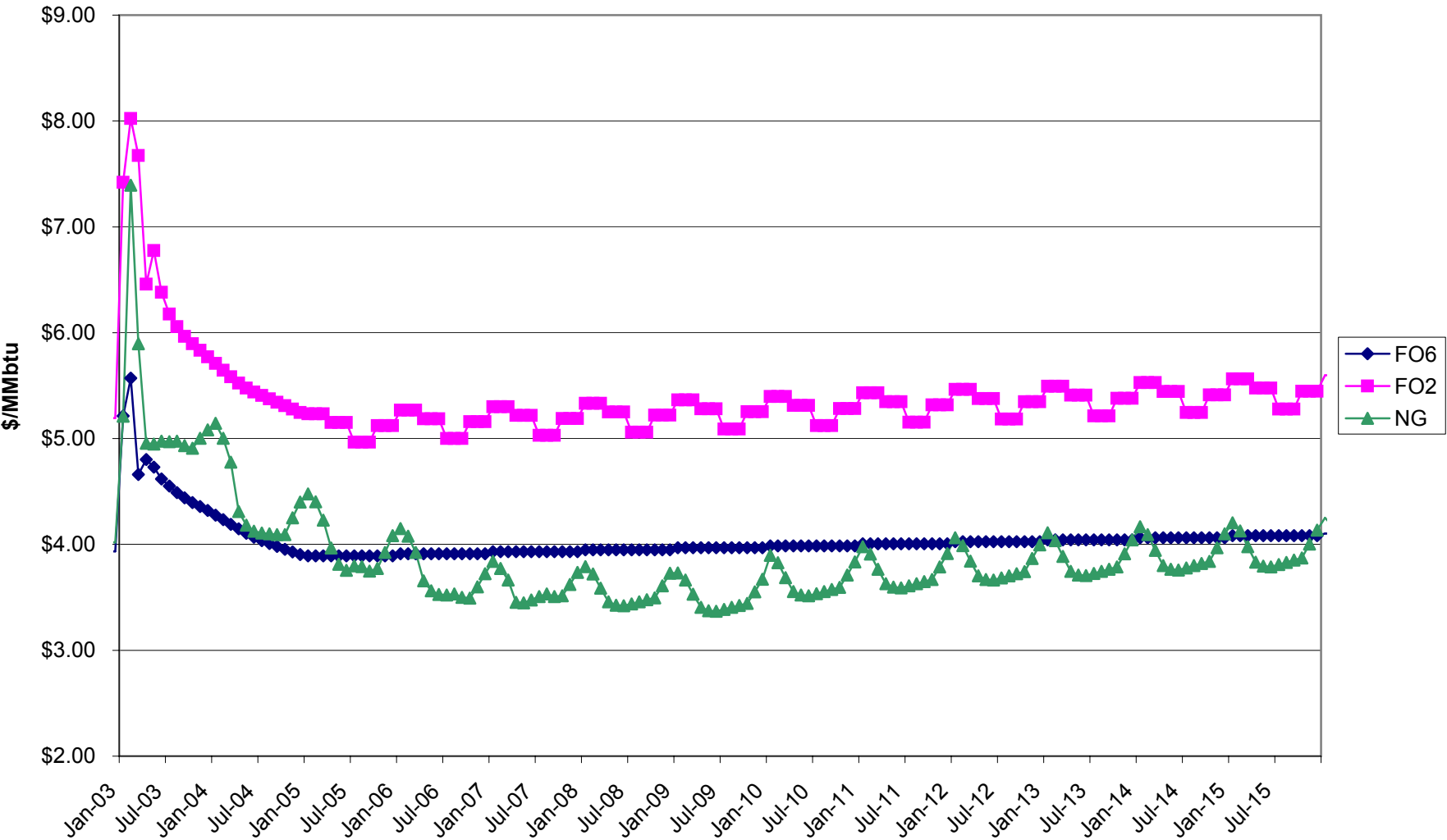


Figure 12. Comparison of Regional Monthly Natural Gas Prices (2003-2015)

